Stability of Money Demand in the Russian Economy after the Global Financial Crisis of 2008-2009

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Abstract: Existence of a favorable socioeconomic climate is now considered as a key factor of the long-term economic growth of a country. This is specifically true for the emerging economies in the modern global economic environment. For the Russian economy which has been facing economic sanctions from the part of Western countries, creation and maintaining of such climate is a crucial issue of survival. From this perspective, the efforts applied by the Bank of Russia and the Russian government were aimed at stabilization of the economy and creation of an attractive economic environment in the country. This paper studies the conditions under which this policy was carried out in 2011-2017. This study specifically focuses on one of the key aspects of success of such policy – stability of the money-demand function (MDF) in the Russian economy. The presence of such stability is studied using the cointegration analysis, and the type of relationship between national income and money demand is also identified. The findings of this research speak in favor of existence of a stable MDF in the Russian economy of that time. Thus, based on the Russian case, the paper's contribution is empirical demonstration of the importance of MDF stability for success of monetary policy which is in line with the extant literature.

Keywords: Money-demand function, socio-economic climate, inflation targeting, cointegration analysis.

1. INTRODUCTION

Generally speaking, creation of an attractive socioeconomic environment in the economy is a very challenging task for any national government. This implies a favorable combination of economic (low inflation rate, stable exchange rate, etc.), political (transparent political environment, low political risks), institutional (freedom and flexibility for doing business), and other conditions. In this study, attention is paid to the economic conditions of investment climate in the country, out of which, in the researcher's opinion, the *rate of inflation* is the leading one, since it basically reflects the dynamics of all other important macroeconomic indicators of the country.

For the Central Bank and the government of the Russian Federation the task of maintaining of a favorable socioeconomic and investment climate in Russia has been especially challenging, because over the past 10 years the Russian economy suffered from three major negative shocks – the global financial crisis of 2008-2009 (GFC hereafter); the introduction of economic sanctions since 2014 from the part of Western countries as a reaction to the events in Crimea of the early 2014; the national currency (ruble) crisis (NCC hereafter) of the late 2014 as a consequence of a sharp decrease of the oil price in the global markets (Gilenko 2017).

Thus, for the Russian Federation, taking into account tough economic conditions of the recent years, favorable socioeconomic and investment environment is a key factor of further economic development. As President of Russia Vladimir V. Putin said at a meeting of All Russia Public Organization "Business Russia" in October 2016, "…attractive investment environment and maximum of business freedom is the best response to any economic sanctions and limitations" (Business Russia 2016).

To ensure price level stability and low inflation, since the end of 2014, the Bank of Russia set an inflation rate target of 4% by the end of 2017, as specified in the official document "Guidelines for the Single State Monetary Policy in 2015 and for 2016 and 2017" issued in November 2014 (Bank of Russia 2014). As it was said in the document, "The Bank of Russia ensures the achievement of the inflation target primarily by affecting the price of money in the economy, i.e. interest rates".

And the Bank of Russia didn't give up on this inflation target despite the facts that in the early 2015, as result of the NCC, ruble sharply lost a half of its value against the USD (hitting almost 70 rubles/USD in the late January 2015) and in the 1st quarter 2015 inflation reached 16.2% YoY (Rosstat 2018).

As a result of joint actions of the Bank of Russia and the Russian Ministry of Finance, by May 2015, ruble significantly appreciated, being close to 50 rubles/USD, as a result of a high inflow of 'hot' foreign financial

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capital. The specific measures taken by these authorities included forcing Russian oil exporting companies sell US dollars of their excessive profits; making government bonds very attractive by setting higher interest rates on them; event implementing new financial instruments, such as government bonds which interest rate is indexed by actual inflation rate, etc.

This actually allowed to stabilize the national currency market, as well as cool down inflation expectations. As of now, it can be said that all these steps resulted in a success – by the end of 2017 the Bank of Russia was actually able to achieve the set inflation target. Moreover, the official yearly inflation rate in 2017 appeared to be 2.5% which is much lower than the target of 4% (Rosstat 2018).

But, theoretically speaking, on the one hand, following Friedman (1970), inflation in the long term is inherently considered as a monetary phenomenon. On the other hand, changing price level in the economy forces *demand for money* also to change. This means that the success of an inflation-targeting monetary policy depends to a large extent on the stability of money demand function (MDF hereafter) in the economy, i.e. the existence of a steady relationship between money balances and the principal determinants of money demand in the long-run.

So, the problem addressed in this paper is the lack of understanding whether there were solid economic and monetary conditions for the Bank of Russia to carry out and to succeed in its inflation-targeting monetary policy. And specifically, the aim of this research is to establish whether the MDF for the Russian economy was of a stable long-run kind over the past several years, which would be a necessary pre-requisite for the policy of inflation targeting by the Bank of Russia to be successful.

To the best of the researcher's knowledge, no recent studies have specifically focused on the money demand in the Russian economy, despite the fact that the question of money demand function has been receiving considerable attention in the literature both for developed and emerging economies. Among few studies on this question for Russia, one can mention (Korhonen and Mehrotra 2010), (Sosunov 2012). But these papers do not cover the recent events – the NCC of 2014-2015 and the economic sanctions – in the Russian economy. This distinguishes the current study.

The rest of the paper is organized as follows. Section 2 gives a literature review on studies on MDF and its components. Section 3 provides a formal methodological framework of the current research. In Section 4 the results of calculations are given and discussed. Section 5 concludes.

2. BRIEF LITERATURE REVIEW

Methodologically speaking, over the past two decades, empirical analysis of the long-run money demand have employed different types of cointegrating procedures, interpreting the found cointegration effect between the main determinants of the money demand function as its stability (see, for example, (Choudhry 1996; Arize, Malindretos, and Shwiff 1999; Hafer and Kutan 2001)).

In turn, the stability of the demand for money has itself received a significant academic attention because of the fact that the knowledge of its causes, consequences and determinants can be efficiently used for the correct setting of monetary policy. Or, as Laidler (1982) put it, "No proposition in macroeconomics has received more attention than that there exists, at the level of the aggregate economy, a stable demand for money function."

As it was shown by Poole (1970), it is the money supply (not interest rate) that should be targeted if, in particular, the demand for money is stable. From this perspective it can already be said that over the last several years (after 2014) the Bank of Russia has managed to hold effective control primarily over money supply in the economy.

The studied question has been subject to thorough research both for the developed and the emerging economies. For example, Choudhry (1996) found stationary long-run M1 and M2 demand functions in the Canadian and the US economies. Bahmani-Oskooee and Bohl (2000) demonstrated that the determinants included in the MDF for Germany were cointegrated which spoke of stability of the MDF. Bahmani-Oskooee and Wang (2007) also shown for the Chinese economy that both M1 and M2 monetary aggregates had a long-run (linear) relationship with the main determinants in the MDF. And so on, because the list of the relevant studies is quite long.

But it is not only the pre-requisites and conditions for the stability of the demand for money that have been discussed, but also the set of the MDF determinants itself has been under close attention. It is not just *national income* and *interest rates* that are of principal importance in an MDF, with interest rate

having been introduced long ago by W. Baumol (1952) and J. Tobin (1956) as one of the explanatory variables in the transactions demand for money (see Section 3 for details). It is important to recognize the influence of other determinants, since their omission from the MDF equation may result in some cases in seemingly unstable behavior of MDF, when actually it may not be true.

As of nowadays, in the scientific literature, currency exchange rates and stock prices are routinely included into empirical analysis of MDF.

Starting with the work of Mundell (1963), who was the first to argue that the demand for money could have *currency exchange rate* as one of the principal determinants in addition to national income and interest rate, a number of studies included this indicator into the studied specifications of MDF. The list of such studies includes but is not limited to: (Karfakis 1991) for Greece; (Bahmani-Oskooee 1996) for Iran; (Civcir 2003) for Turkey; and (Bahmani-Oskooee and Wang 2012) for China.

Also, after Friedman's seminal work (see Friedman 1988) which was the first to emphasize the importance of *stock market prices* in the MDF for the US economy, a number of studies found strong evidence that stock prices are important in the specification of MDF both for developed (see, for example, (Thornton 1998; Kia 2006)) and for emerging economies (see, for example, Caruso 2001; Wu *et al*. 2005).

Based on all the above-mentioned considerations, in this study, the researcher offers the details and empirically estimates MDF for the Russian economy after the GFC.

3. THEORETICAL FRAMEWORK OF THE STUDY

The long-term MDF employed in this study relates money balances to a number of determinants (as discussed in Section 2) associated both with the actual economic transactions, and the alternative costs of money holding. Specifically, the MDF is as follows:

$$\log M_t = b_0 + b_1 \log Y_t + b_2 ir_t^{rus} + b_3 ir_t^{ecb} + b_4 \log rubeur_t + b_5 \log sp_t + u_t, \quad (1)$$

where M is money balances (stock of money in the Russian economy); Y is nominal income of the Russian economy; ir^{rus} is the internal (Russian) key interest (refinancing) rate; ir^{ecb} is the foreign (European) key interest (refinancing) rate; $rubeur$ is the ruble/euro nominal exchange rate[1]; sp is the financial market stock price index[2]; u is the disturbance term.

Relationship between M and Y is the core of the MDF. There are two major theoretical concepts that can be employed to explain it: *the quantity theory of money* (QTM hereafter) and *the Baumol-Tobin model* (BTM hereafter).

While the classical QTM puts forward a simple idea of proportional relation between national income and money demand in the economy, the BTM explicitly takes into account the influence of interest rates and transaction costs in the economy in the sense of existence of alternatives to unsophisticated holding of money (Baharumshah *et al*. 2009).

On the one hand, from the key equation of the QTM (where *V* is money velocity which positively depends on interest rate *i*):

$$M = \frac{Y}{V(i_+)}, \quad (2)$$

it follows that

$$\log M = 1 \cdot \log Y - 1 \cdot \log V(i_+). \quad (3)$$

So, theoretically speaking, according to the QTM, income elasticity of money balances should be 1, and the money stock is negatively related to the interest rate. Thus, broadly speaking, the QTM suggests that changes in national output should be accompanied by proportional (and timely) changes in money supply for sustainable development of the economy (given other parameters more or less stable).

On the other hand, from the BTM it follows that:

$$M = \sqrt{\frac{\delta Y}{2i}}, \quad (4)$$

which, in turn, means

$$\log M = \frac{1}{2} \log \frac{\delta}{2} + \frac{1}{2} \cdot \log Y - \frac{1}{2} \cdot \log i \quad (5)$$

where δ is a parameter related to transaction costs.

[1]The ruble/US dollar and ruble/euro nominal exchange rates are traditionally (and empirically) very closely correlated. For the period under consideration, their correlation was about 98.85%, so we chose only one of them (ruble/euro) for consistency of calculations.

[2]Usually, the nominal variables in Eq. (1) are considered in real terms, i.e. corrected for price level changes. Mathematically speaking, it just means subtraction of log(P) from both parts of the equation. We *do not* do this correction because, on the one hand, we are interested in the interplay of the nominal variables, and, on the other hand, such transformation may introduce unnecessary biases to the variables.

Equation (5) is basically to say that the income elasticity of money demand is 0.5 meaning that if nominal income increases, then the transaction demand for money increases less proportionally, leading to a rise in the income velocity of money.

Out of (3) and (5), turning back to (1), the following are theoretically stated:

- it is the estimate of b_1 that will speak in favor of one of the two theories;
- it is also a fact that the both theories suggest that money balances are positively related to nominal income and negatively to the interest rate; so, we expect b_1 to be positive, while b_2, b_3 – negative;
- since the principal alternatives to simple money holding are buying foreign currency and investing in the financial market, we expect b_4, b_5 to be positive, since increases in variables $rubeur$ and sp could spur up demand for money for financial investment purposes.

To sum up, it is important to keep in mind two principal things when we speak about an MDF. Firstly, whether it is stable, i.e. econometrically speaking, whether all its components (though, expectedly, non-stationary) are cointegrated. So, one will have to check stationarity of the variables used, and test whether they are cointegrated within the model presented by equation (1). In turn, stability of money demand possesses the merits of using monetary aggregates as the bases for monetary policy (Hamburger 1987).

Secondly, the two theories represent different outlooks on the nature of elasticity of reaction of money demand to changes in national output. By finding out this nature for a specific economy, one can draw conclusions on the influence of interest rates and alternative savings in the economy, as well as the presence of significant transaction costs. As a result, again, the knowledge of the nature of the MDF will give the policy-maker necessary insights for conducting their monetary policy.

This leads us to the following principal research questions (RQ) of this study.

> *RQ1: Did there exist a **stable** MDF (i.e., a cointegration relationship between the components of MDF) in the Russian economy after the GFC?*
>
> *RQ2: If it existed, the nature of which of the two theories the MDF reflected?*

In order to answer these questions, the researcher collected the necessary empirical information on the Russian economy, and ran a cointegration analysis for the components of the MDF, as described in the following section.

4. CALCULATION RESULTS AND DISCUSSION

4.1. Sample Description

To estimate the MDF for the Russian economy (as specified by (1)), the researcher used quarterly data for the period from 2011: Q3 to 2017: Q2 (24 observations). The choice of this specific time-period is justified by the following facts. On the one hand, the starting point of the 3rd quarter of 2011 is taken because by that time the Russian economy majorly recovered from of the GFC (as witnessed by many macroeconomic indicators). On the other hand, the ending point of the 2nd quarter of 2017 is selected because by that time it became obvious to the experts that, after the NCC of 2014-2015 and the followed stabilization of the situation in the Russian economy, the Bank of Russia indeed had very high chances of reaching its 4% inflation target.

The information was collected from the official web-sites of the Russian Federal Statistical Service (www.gks.ru), the Eurostat (ec.europa.eu/eurostat), the Bank of Russia (www.cbr.ru), and the Moscow exchange (www.moex.com).

Based on the specification of MDF given in Eq. (1), the researcher took monetary aggregate M2 as variable M. As variable Y, the researcher used Russian nominal GDP deseasonalized with the standard X13-ARIMA seasonal adjustment procedure, since the GDP reflected a strong seasonal pattern.

The key interest rates were changed several times over the period of study both by the Bank of Russia and by the European Central Bank. This is why as variables ir^{rus} and ir^{ecb} the researcher correspondingly calculated weighted key interest rates for each quarter, where the weights were the durations of the corresponding values of the key interest rates in the quarter.

As variable $rubeur$, the researcher took the value of the nominal ruble/euro exchange rate on the last trading day of the corresponding quarter. In the same manner, the closing price of the market index of the Moscow exchange on the last trading day of the quarter was taken as the sp variable.

Table 1: Summary Statistics of the Variables

Variable	Measurement units	Mean	Median	S.D.	Min	Max	Integration order
M2	bln rubles	30645	30663	5065	21480	39625	I(1)
NGDP	bln rubles	19239	19805	2254	15171	22615	I(1)
IRrus	%	9.298	8.583	2.185	5.500	15.53	I(1)
IRecb	%	0.392	0.178	0.456	0.000	1.467	I(1)
RubEur	ruble/euro	54.99	49.50	13.95	39.17	79.70	I(1)
SP	rubles	1605	1490	248.5	1330	2233	I(1)

Source: author's calculations based on official data.

All the variables were tested for the order of integration by the Elliot-Rothenberg-Stock (ERS) unit-root test. The results of this test, as well as other summary statistics, are given in Table **1**. The key point is that all the variable proved to have a I (1) order of integration, as initially expected. This met the requirements to carry on with cointegration analysis.

4.2. Cointegration Analysis Results

The variables described in Table **1** were tested for cointegration within the MDF specification (see Eq. (1)) using the augmented Engle-Granger test (AEG-test) for cointegration. The presence of cointegration was supported at the 10% level of significance (tau statistic = -4.164; asymptotic p-value = 0.0913).

Thus, RQ1 has a positive answer – indeed, after the GFC, taking into account the NCC, there was a stable MDF in the Russian economy. As discussed above, for the policy-maker this means that monetary aggregates (in this case, M2) could indeed be used for conducting monetary policy, specifically, inflation targeting.

It its well-known that over the studied time-period the Bank of Russia (besides using other instruments) actively tried to control money supply (M2) in the economy by changing (decreasing) the monetary base. Specifically, for the first six months of 2015 the broad monetary base was dropping at a monthly rate of 2% approximately. This was an attempt to lower the monetary inflation in the economy. The obtained results speak in favor of the adequacy of this policy.

4.3. Regression Analysis Results

After supporting the cointegration effect, Eq. (1) was estimated using the OLS routine. The results of estimation are presented in Table **2**. The formal results of the traditional tests for this model indicate both statistical adequacy and a very high goodness-of-fit of the model for MDF (see note to Table **2**).

This allows to discuss the obtained results of estimation. First, all the estimated coefficients have expected signs, as commented on in Section 2. This majorly means that the specification of MDF is economically correct. But, unfortunately, not all of them are statistically significant. Specifically, the coefficients before ir^{ecb} and $rubeur$ are not significant. This may be explained as follows.

On the one hand, the absence of a statistically significant reaction of the Russian demand for money

Table 2: MDF Estimation Results (Dependent Variable logM2)

Variable	Coefficient	Std. Error	t-ratio	p-value
const	−1.6267	3.3813	−0.4811	0.6363
log(NGDP)	1.0118**	0.4022	2.516	0.0216
IRrus	−0.0129**	0.0049	−2.650	0.0163
IRecb	−0.0452	0.0804	−0.5613	0.5815
log(RubEur)	0.0231	0.0732	0.3149	0.7564
log(SP)	0.2734**	0.1059	2.580	0.0189

** denotes significance at the 5% level of significance.
Note: the F-test statistic = 93.906 with p-value = 2.99e-12; the Doornik-Hansen normality test statistic = 0.413 with p-value = 0.813; the Breusch-Godfrey test statistic (8) = 1.32 with p-value = 0.334; the Breusch-Pagan heteroscedasticity test statistic = 4.011 with p-value = 0.5479; the Ramsey's RESET test F-statistic = 1.32 with p-value = 0.294; Akaike criterion = −85.684; R-squared = 0.963.
Source: author's calculations.

to changes in the ECB key interest rate may be due to the fact that (a) the ECB key interest rate has been very small (as compared to the key interest rate of the Bank of Russia) over the period under consideration, and, moreover, virtually did not change since the middle of 2014, staying very close to 0%; (b) due to the economic sanctions, introduced by the Western countries against the Russian Federation, the Russian economic agents actually have not had sufficient access to the Western financial markets – thus, the ECB key interest rate did not work well as an indicator of changing alternative costs. On the other hand, the Russian key interest rate proved to have a significant influence on the MDF.

The insensitivity of the Russian MDF to changes in the ruble/euro nominal exchange rate may stem from the fact that after the national currency crisis in Russia in December 2014 (see [2]), ruble was slowly appreciating against euro (and the US dollar), and, as of now, the ruble nominal exchange rate remains comparatively stable. This does not create incentives for the Russian economic agents to make active financial investments in euro and/or US dollar.

On the contrary, after December 2014 the Russian financial market was growing very rapidly heated by the inflow of financial capital from abroad which was caused by the high interest rates in the Russian economy. This is why the coefficient before variable sp is statistically significant.

Finally, in order to answer RQ2, the researcher ran a test for linear restrictions for the estimate of income elasticity $(\hat{b}_1 = 1.0118)$, since it was statistically significant and mathematically very close to 1. With $H_0 : b_1 = 1$ and F-test statistic = 0.0009, the obtained p-value = 0.977 speaks in favor of the null hypothesis.

This supports the fact that after the GFC the Russian demand for money was of a QTM kind, not BTM (transactions) type, and the money demand itself was growing proportionately to the growth of the post-GFC Russian economy. For the policy-maker this means that the conducted monetary policy aimed at either tightening or loosening money supply in the economy will be quite quickly (proportionately) reflected in the economic activity of the country (accounting for other principal MDF determinants).

5. CONCLUSION

The demand function for money is of crucial importance for understanding macroeconomic activity and for making policy recommendations. This is why the questions of stability of MDF, the set of its components, as well as the

For the post-GFC Russian economy over 2011-2017, suffering from the consequences of the national currency crisis (2014-2015) and economic sanctions, the study found that (a) the MDF was stable over the time-period under consideration; and (b) the MDF was of QTM-type.

The obtained results indicate that for the Bank of Russia there definitely had a solid ground to conduct its monetary policy which allowed eventually stabilizing the Russian economy and achieving the set inflation target of 4% by the end of 2017. And, under these tough economic conditions, the Bank of Russia and the Russian government were actually quite successful, at least, in their attempt to maintain an attractive economic environment in the country.

Thus, based on the Russian case, the paper's contribution is empirical demonstration of the importance of MDF stability for success of monetary policy which is in line with the extant literature.

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